

## **Exploring a systemic framework for intervening in a current local sustainability issue – Traveston Crossing Dam**

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It is widely stated that Australia is in a water crisis. Resolving this crisis is extremely complex, given the uncertainty of rainfall, the importance of water security and the diversity of environmental and social values associated with different approaches to achieving such security. In this paper, we consider a case study of the controversial proposal to build a mega dam at Traveston Crossing, west of Noosa, which is a key element in the Queensland Government's strategy for reducing the risk of Brisbane running out of water. The first two authors share personal experience as residents of the communities affected by this proposal and this paper represents an effort to both analyse the decision-making process to date that surrounds the proposed Traveston Dam and identify approaches to intervene in this issue. Our analysis is based on a systemic framework informed by systems thinking and respect for diverse social and environmental values. Specifically, our framework is based on ecofeminism to guide our way of thinking, and permaculture principles to guide our way of doing. Our analysis of the proposed Traveston Crossing Dam using this framework illuminates and the need for adaptive management and integrated resource planning to be alternative approaches to natural resource management. Our analysis also highlights the imperative for greater engagement and negotiation of diverse social and environmental values associated with water. Consequently we call for a community and stakeholder engagement process "*South East Queensland Conversation on Managing Risks around Water Security*" which would provide a much-needed space for informed debate on the broad values and perspectives of risk that exist in South East Queensland with respect to securing its water supply.

## **Introduction**

The need for a secure water supply and the associated environmental, social and economic consequences of different approaches to reducing the risk of cities running out of water creates a complex decision making milieu. In such situations, values become prominent, particularly values held by governments, different communities and groups about how natural resources such as water should be managed, and how complexity should be negotiated in a democratic society. In this paper we consider a case study of such a situation: a current controversial issue which is part of the Queensland Government's plan to provide a secure water supply to South East Queensland (SEQ), Australia, until 2050. The case study is based on the proposed construction of a mega dam<sup>1</sup> at Traveston Crossing on the Mary River approximately 150km north of Brisbane, Queensland to provide drinking water to Brisbane.

Controversy surrounding the project has arisen from several angles including suggestions that the dam is actually not needed, concerns regarding whether it is the best approach to deal with future water security of SEQ, criticisms of Queensland Government's decision making and community engagement process surrounding the issue, and the magnitude of the local social, environmental and economic impacts if this dam were to proceed.

In this paper we have taken the stance advocated by Midgley (2000, p.2) that a systemic intervention in this issue would be enhanced by mutually supporting philosophy, methods and practice. This is in contrast to the Queensland Government approach which is characterised by ad hoc scientific method. We explore how a philosophical position informed by ecofeminism and permaculture, which is based on the use of principles derived from the operation and organisation of ecological systems, could be mutually supportive of alternative approach to resolving the issue of SEQ's future water security that contribute to a reinvention of sustainability based on core values of respect for both people and the environment. Ecofeminism and permaculture are linked through a shared concern for both social and environmental outcomes and a strong connection to ecological principles and ethics. The combination of the two offers an epistemological foundation to guide our way of knowing, and practical guidance to guide our way of doing as members of the communities opposed to the construction of this dam. We explore how these perspectives might inform an alternative approach which draws on a selection of methods to resolve the issue of SEQ's future water security in a way that contributes to a reinvention of sustainability based on core values of respect for both people and the environment.

Whilst it would be possible to write this paper as a critique of the Queensland Government's handling of the issue, this has been provided elsewhere<sup>2</sup>. Instead, we

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<sup>1</sup> Final stage of this project would have a yield of 150 GL/a (1 GL = 1,000,000,000 L)

<sup>2</sup> Examples include the 180 submissions provided to the Inquiry being conducted by the Senate Committee for Rural Affairs and Transport by groups and individuals opposing the dam (2007) and the three main community group websites: [www.savethemaryriver.com](http://www.savethemaryriver.com), [www.ourgreatsandy.com](http://www.ourgreatsandy.com) and [www.swampnews.com](http://www.swampnews.com).

have chosen to focus on offering an alternative approach based on alternative environmental and social values which we believe would have very different social, environmental and economic outcomes.

In order to provide a sense of perspective to these alternatives, the following section provides the context of the events that surrounded and have followed the Queensland Government's announcement that the dam would be built.

## **Brief background to the SEQ Water Crisis and the Traveston Crossing Dam issue**

In this section we locate the region and identify and briefly explain contextual factors which we believe have played a significant role in the decision to build Traveston Dam: the drought and the state election held in 2006.

The Mary River Valley is situated 150 km north of Brisbane. Figure 1 provides a map locating the Mary Basin in Queensland and Figure 2 shows the location of the Traveston Crossing Dam relative to Noosa.

### ***Drought and a State Election***

Records indicate that SEQ is currently experiencing its worst drought. This has led to the introduction of water restrictions in Brisbane, which first commenced with Level 2 restrictions in October 2005 and changed to Level 5 restrictions<sup>3</sup> in April 2007. The communities that live in the Mary Basin have been affected by the drought through reduced agricultural productivity and restrictions on town water supplies.



**Figure 1 Location of Mary Basin in Qld (source: DNR website, accessed 25 April, 2007 25)**

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<sup>3</sup> The target water use under Level 5 restrictions is 140 L/person/day, which is less than half of the daily usage that the business as usual scenario of the SEQ regional water supply strategy (SERWSS) assumes of 300 L/person/day (Queensland Government 2007)



**Figure 2 Map showing Location of the Proposed Traveston Crossing Dam**

With the failure of substantial rainfall during 2006/2007 over the traditional wet season November to February, dam levels continue to fall. At the time of writing, combined dam water levels for SEQ were 18.19% as of 19 June 2007 (<http://www.qwc.qld.gov.au/HomePage>, accessed 19 June 2007) and there is real concern that SEQ will run out of water. In fact, latest projections from the South East Queensland Water Corporation indicate that if no action was taken and good rainfall does not come within the next 12 months, SEQ would run out of water by July 2008<sup>4</sup>.

A state election was held in July 2006. Water security and the Government's proposed water grid network to 'drought proof' SEQ featured as a prominent issue in the lead up to this election as the following quotes from Queensland Parliament Hansard demonstrate:

*"This is a site that had been investigated and ruled out. The question is: what has changed? The only thing that has changed is that we have an election coming up and we have a Premier who is desperate to show people that he is serious about doing something on water. That is what is different. It was never on the agenda until the election started to loom on the horizon."* Mr Quinn, former leader of Queensland Liberal Party, Queensland Parliament, 7 June 2006

<sup>4</sup> [www.seqwater.com.au/content/standard.asp?name=DamOperationsMaintenance](http://www.seqwater.com.au/content/standard.asp?name=DamOperationsMaintenance), accessed 19 May, 2007.

The Labor government was re-elected. The following quote from Deputy Premier Anna Bligh shows her perspective that the government has a clear mandate from the people of Queensland to build the dam:

*“Of course the big poll on the issue was held at the state election last year. We went to the election on the issue of water. We went to the election saying that we were going to build a dam at Traveston Crossing. Those opposite went to the election on the basis that they would not construct that dam. I think the results of that particular survey are available for all to see.”* (Queensland Parliament 2007), 19 April 2007)

### **Teasing apart the complexity**

The decision to build the dam is a complex issue which has evolved over more than 12 months to include many agents and events. A cognitive map has been provided in Figure 3 to illustrate what we consider to be the main agents, the key events and the relationships between them. Agents, events and organisations that appear on the map are notated in the text that follows which describes the cognitive map. We begin with the Premier’s announcement (a) on 27 April, 2006 that a mega dam across the Mary River at Traveston Crossing was the government’s preferred option for introducing a large additional water supply into the SEQ system (see Figure 4 for picture of the dam site). When asked by Queensland Senator, Barnaby Joyce on what premise the site had been selected in the absence of the relevant technical studies, Mr Dennien (Executive Director of Planning, QWC) replied “yields” (Senate Inquiry, 18<sup>th</sup> April, 2007). This yield was determined by a desktop study into the suitability of a range of sites finalised in June 2006 (GHD Pty Ltd 2006).

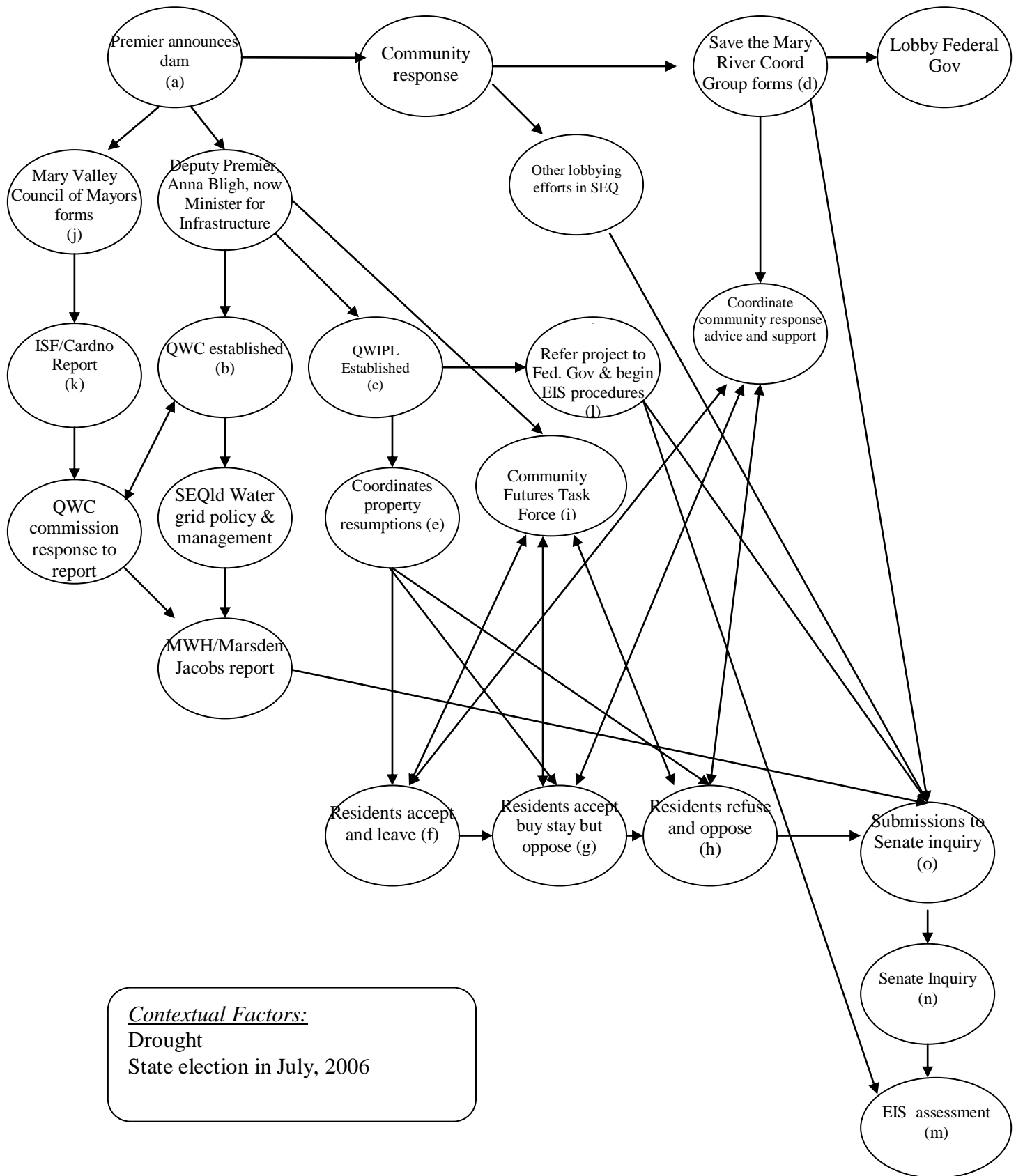


Figure 3 Cognitive map of agents and series of events



**Figure 4 Traveston Crossing - approximate location of proposed dam wall (photo taken March 2007 by Anne Stephens)**

This dam is part of a larger, \$9 billion strategy to create a “water grid” to drought proof SEQ. The grid will consist of a series of pipelines connecting existing water storage and treatment plants, waste water recycling, a desalination plant and measures to reduce demand for water such as subsidies for water saving devices, rain water tanks and new building codes (Queensland Department of Infrastructure 2007a). The Queensland Water Commission (QWC) (b) was formed in June 2006 to oversee and manage the implementation of this strategy. The role of the QWC is to “ensure sustainable water supplies by developing long term water supply strategies, establishing a regional water grid, implementing water restrictions, managing water demand, providing advice to government and reforming the water industry” (Queensland Water Commission). The Government established the Queensland Water Infrastructures Pty Ltd (QWIPL) (c) in June 2006, to project manage the construction of several pieces of new capital infrastructure required to complete the new water grid, including the Traveston Crossing Dam (Queensland Water Infrastructure 2007b).

According to the QWC, additional dams and weirs will contribute 20% of long term water balance (Queensland Water Commission 2007b). Traveston Crossing Dam would provide 16% of the government’s projected yield required in SEQ by 2050 and 49% of the additional yield to be provided as part the long term planning strategy (Queensland Water Infrastructure 2007a). Traveston Crossing Dam has been divided into three stages. The first is construction of the dam which would cost \$1.7 billion (Proof Committee Hansard 2007b), provide a yield of 70 GL/a, inundate 3000 ha

(Queensland Department of Infrastructure 2007b). The second stage involves the raising of the wall of the Borumba dam, upstream of the Traveston Crossing site, in approximately 2025. The third would involve filling the Traveston Crossing Dam to the full height of the wall constructed in Stage 1, “should it be determined as needed in the future” and “ may be complete by 2035” (Queensland Department of Infrastructure 2007b). The combined yield of this three stage system is predicted to be 150 GL/a according to Queensland Government figures. The final operational level of the Traveston Crossing Dam would flood 7135 ha. A detailed breakdown of costs of stages 2 and 3 were unavailable from the Queensland Government at the time of preparation of this paper.

The proposal has involved and impacted various communities. For the purposes of this paper we have identified three distinct communities affected by or involved in this proposal. These are the community of the Mary Basin, the community of Brisbane who would use water from Traveston Crossing Dam and the academic and professional community who have been involved in the issue. The Mary Basin community includes many groups of people directly and indirectly affected both up and downstream of the proposed dam. Immediately after the announcement of the dam, rallies and public meetings were organised by the Mary Basin community and the Save the Mary River Coordinating Group (d) in May 2006. People whose land will be needed for the dam or for rerouting of roads received a letter from QWIPL dated November 15, 2006, in which they suggested they had finalised the dam’s boundary and the properties required for acquisition (e). The letter sent to one of the paper’s authors stated: “In order to allow landholders to plan for the future with certainty, QWI will acquire all land required for the new sections of road now, even though the road relocation may not occur for some years”<sup>5</sup>. Some of these people have elected to sell their properties to the Government and leave the region (f), or sell and take advantage of lease back options and stay in their homes. A percentage of these people continue to oppose the dam (g). An indefinite number of residents oppose the dam (h) and will not enter into negotiations with QWIPL whilst others continue to consider their options accessing support and advice from the Save the Mary River Coordinating Group (d) and the Community Taskforce<sup>6</sup> agencies (i). At the time of this paper’s completion in early June 2007, 52% of the properties of stage 1 and 2 had been resumed (Mike Spencer 2007).

With regard to the viewpoints and opinions of the Brisbane community, to our knowledge there has been no formal research. However, Queensland Government politicians, such as Deputy Premier Anna Bligh appear convinced that Brisbane residents are in favour of the dam as the following quote suggests:

*“I have every confidence that the two million people who live in south-east Queensland who understand what is happening to our water situation, who understand how important it is that we put in place new water storages, including this dam, understand how important this all is.” Queensland Parliament, 19 April 2007*

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<sup>5</sup> letter from Graeme Newton, CEO QWIPL, Nov 15, 2006

<sup>6</sup> created by the Queensland Government to act as a conduit between Mary Valley and the Queensland Government.



The third and final community we have identified is the academic and professional community. The involvement of this community ranges from commissioned academic research to experts acting in a private capacity. A report commissioned by the Mary River Council of Mayors (MRCOM) (j) was completed by the Institute of Sustainable Futures (ISF) at the University of Technology, Sydney and the Brisbane office of engineering consulting firm, Cardno (k) in February 2007 (Turner et al. 2007). This report cast doubt upon the need and appropriateness of this mega dam and will be discussed in more detail in a later section. Experts acting in a private capacity include Jean Joss, an expert on the Queensland Lungfish from Macquarie University in Sydney, who believes this proposal places this fish a risk of extinction (Senate Inquiry Hansard 2007a) and Rob Hales who has conducted an analysis of the social impact assessment process followed by the Queensland Government and found it to be lacking by international standards (Senate Inquiry Hansard 2007c).

Because the Traveston Crossing Dam proposal triggers a piece of Federal Legislation called the *Environment Protection and Biodiversity Conservation Act* (1999) the QWIPL is required to conduct an Environmental Impact Statement (EIS) (l). This legislation requires QWIPL to consider impacts on 18 vulnerable and endangered species that rely on the Mary River, the Great Sandy Straits World Heritage Area and RAMSAR listed wetlands and migratory species. The final terms of reference for the EIS were due to be provided to the public and the proponent in May 2007. However they have not been made available on the Department of Infrastructure website (Queensland Department of Infrastructure 2007b). Based on the outcome of the EIS, the Federal Minister responsible for Environment has the authority to stop the project (m).

Successful lobbying by the community of Federal Senators caused Senators to vote to hold a Federal Inquiry (n) on 26 February 2007. The Senate Committee on Rural and Regional Affairs and Transport (SCRRAT) Terms of Reference are to explore:

- the Queensland government's handling of the project,
- the viability of the dam at Traveston, and
- alternate water sources for the SEQ region.

The Inquiry received 180 submissions (o) and held two days of hearings in Gympie and Brisbane April 17 and 18 and two days of hearings in Canberra on May 11 2007 and June 4 2007.

In the next section we will introduce the systemic framework which we use as a lens for analysing this issue and then go onto explain how this framework provides fertile ground for suggesting an alternative approach to this issue, focussing on community participation, natural resource management and approaches to risk.

## **Our systemic framework for analysing this issue**

In this paper we draw on ecofeminism and permaculture to provide a systemic framework to review the environmental and social values expressed around the Traveston Crossing Dam case study, and to posit an alternative model to move toward an improved process for handling this and other complex risk situations.

Ecofeminism provides epistemological guidance for thinking about how we value our natural and social resources embedded within a complex ecological system, an ecological ethic which "...rejects the dominance, competition, materialism, and techno-scientific exploitation inherent in modernist, competition-based social systems. Ecofeminism instead assumes that healthy interactions are based on caring and compassion and the creation and nurturing of life" (Besthorn & McMillen 2002, p. 226)

Ecofeminists are interested in exploring the connections between the exploitation of nature and the costs for all human beings (Merchant, 1999, p xxi) as "... energy, matter and reality are related to the greater whole" (Besthorne & McMillen, 2002, p.225). For this reason the ecofeminist ethic rethinks our understanding of the role of the 'expert scientist'. Ecofeminist, Vandana Shiva, is critical of the myth of objective science that suggests science is a "... value-free system of knowledge, which by the logic of its method claims to arrive at objective conclusions about life, the universe and almost everything." (Mies & Shiva 1993, p. 22). Ecofeminism also critiques the privileging of 'expert knowledge' and the associated discourse that pitches non-specialist knowledge as ignorance and scientific knowledge as really the only way of knowing (Mies & Shiva 1993, p. 23). We interpret this critique as a call for respect for diverse ways of knowing and greater recognition that the role of 'expert knowledge' needs to be situated within explicitly sought broader social and environmental values.

To understand how to enact this ecofeminist stance in practical terms, we turn to the principles of permaculture. Permaculture principles have been drawn from the observation, study and experience of the function of ecosystems and "arise from a way of perceiving the world that is often described as 'systems thinking' and 'design thinking'" (Holmgren 2004, p.6). Although typically associated with grass roots local scale efforts to provide food shelter and clothing etc, the permaculture principles are aligned with the complex systems view of the world outlined by the ecofeminists such as Mies & Shiva (1993), (Merchant 1989) and (Warren 2000) and consequently, these principles have potential to guide the creation of sustainable systems.

Permaculture is a diverse field full of diverse interpretations of how ecological principles can be used and related to our day to day choices and activities. For the purpose of this paper we have chosen to adopt the set of principles devised by David Holmgren {, 2004 #46; Holmgren, 2002 #47}. The ethical principles of permaculture provide the basis of the link between ecofeminism and permaculture. According to Holmgren (2002, 2004) these ethical principles are earth care, fair share and people care. These ethical principles are enacted in the world through twelve design principles. We focus on four of these principles in this paper which are most relevant to guiding a permaculture based approach to water security in SEQ.

The data sources used in our analysis are wide ranging. We have accessed and used all publicly available sources, including media reports, the Senate Inquiry, debates in Queensland parliament and various technical reports. In addition we incorporate our own personal experience and knowledge of the situation as the first two authors of this paper are residents of the Mary Basin.

## **Analysis of the issue using the Ecofeminism/Permaculture systemic framework**

Our analysis of the issue focuses on the approach taken by the government to natural resource management (specifically biodiversity and water planning) and to community participation. We focus on these two issues as they are central to the focus of ecofeminism and permaculture in that they together are intimately related to and influenced by the environmental values and ethics we hold as a society.

### ***Natural Resource Management***

Natural Resource Management encompasses how we use and preserve our natural resources. Two aspects of natural resource management (NRM) are of particular significance in this issue: biodiversity conservation and water planning. Approaches to NRM are deeply influenced by the environmental values that we hold as a society and we would suggest that the environmental values exhibited in the case study of Traveston Dam conflict with the values espoused by ecofeminism and permaculture. We will consider biodiversity conservation and water planning in turn, explain these conflicts. Adaptive management and integrated resource planning are identified as existing methods of biodiversity conservation and water planning that are mutually supporting of the philosophy of ecofeminism and permaculture.

### ***Biodiversity conservation***

There are major conservation risks created by the Queensland Government's decision to build Traveston Crossing Dam. There are three species that are endemic to the Mary River and have limited habitat elsewhere in the region. These are the Queensland Lungfish (*Neoceratodus forsteri*), the Mary River turtle (*Elusor macrurus*) and the Mary River cod (*Maccullochella peelii mariensis*). All of these species are very long-lived and the dam will drastically change their environment, and combined with cumulative impacts from other developments<sup>7</sup>, may send them to extinction. The Queensland Government has proposed a fish ladder at the dam wall to mitigate threats to these species without evidence that confirms these species will successfully use such a ladder (Senate Inquiry Hansard 2007a). Flooding of the majority of these species breeding grounds by the dam cannot be mitigated. The Queensland Lungfish is of particular significance as it an ancient species estimated to be at least 100 millions years old (Senate Inquiry Hansard 2007a) and is a sacred animal to the Gubbi Gubbi people of the area. The following quote from Dr Fesl, Elder of the Gubbi Gubbi people explains the significance of this animal to her people:

*“The ancients of my people have told us since we were very small children that we must care for this creature. We must not eat it. We must not let anyone hurt it. We did not know why, but we found it to be a friendly fish. If you go in a canoe, it will come up and you can stroke it. It lives to be 100 years old and grows to 1.5 metres in length”*(Senate Inquiry Hansard 2007b).

The focus of the scientific investigation for lungfish has been influenced by a set of values that suggest technology can ‘fix’ the environmental problem of the potential

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<sup>7</sup> For example, the recently constructed Paradise Dam on the Burnett River impacts the Queensland Lungfish (Senate Inquiry Hansard 2007a).

loss of lungfish rather than making it an imperative to consider the impact of changes to the environment on the entire life cycle of the species. For example, the Government has not, at this stage, conducted population viability analysis which Dr DeVantier, ecologist, indicated is:

*“a standard method of looking at risks of extinction and which you would expect to be automatically included in any environmental impact statement where there are globally and nationally threatened species involved” (Senate Inquiry Hansard 2007b).*

An ecofeminist perspective would advocate for methods such as population viability analysis provided such methods were used to inform an understanding of the complex interrelated nature of the complex ecosystems in question. Unlike, the Queensland Government’s choice to reduce the inimitable biodiversity of the Mary Basin to a technical solution, ecofeminism and permaculture principles regard decisions around biodiversity conservation as inherently social and environmental. Consequently an approach based on these perspectives positions rigorous scientific analysis as a tool to facilitate negotiation of diverse social and environmental values and regards the Mary Basin as a complex ecosystem whose existence and services support extensive non-human and human communities. Permaculture principles, such as “use and value diversity”, offer a way to see how to put this epistemological position into action. An approach, which is consistent with many aspects of ecofeminism and application of permaculture principles, that exists in adaptive management. Adaptive management offers a means for confronting uncertainties in natural resource management (Gunderson 1999). According to Jiggins and Röling (Jiggins & Röling 2000, p. 29), adaptive management is:

*“an approach to the management of complex systems based on incremental, experiential learning and decision making buttressed by active monitoring of and feedback from the effects and outcomes of decisions”*

Our contention is that the combination of ecofeminism, permaculture principles and adaptive management offer are mutually supporting approach to biodiversity conservation that is more sound and inclusive than the Government’s strategy and more robust than adaptive management on it’s own.

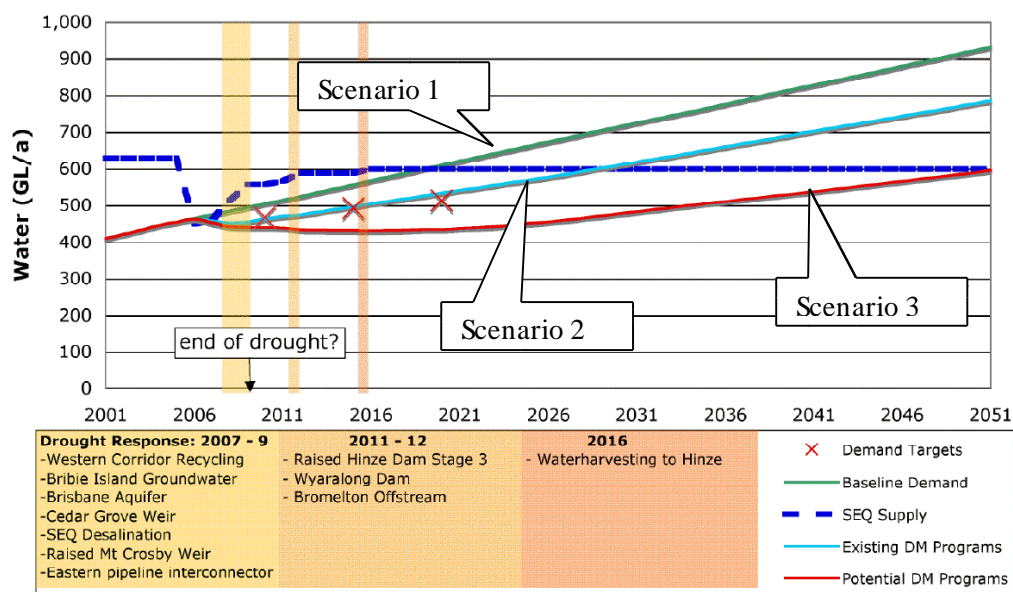
### *Water planning*

The Queensland Government’s approach to water planning incorporates a diverse strategy, and they have argued that Traveston Crossing Dam is needed to fill a predicted gap between supply and demand.

Prior to considering how the alternatives differ from the Queensland Government’s approach, it is helpful to understand a key tool of water planning called the supply demand balance. Supply demand balance is the term used to describe whether the future demand for water is matched by the supply of water and it is used in long term planning of water management to account for changes in population, water usage and to some extent, the impact of climate on water supplies. Figure 5 depicts the analysis of the supply and demand presented in the Mary River Council of Mayors (MRCOM) report (Turner et al. 2007) and three different scenarios of future projected demand in SEQ. These are Scenario 1: the do nothing scenario, Scenario 2: the Queensland

Governments current scenario and Scenario 3: an alternative scenario proposed in the MRCOM report.

The horizontal line in Figure 5 shows the systems yield, excluding Traveston Crossing Dam, but including all other options proposed by the Queensland Government to be approximately 600 GL/a from 2016 to the end of the planning horizon. A key point to note is that the current strategy represented by Scenario 2, will ensure that supply will not exceed demand for another 20 years, and that with additional demand management strategies as proposed by Scenario 3, supply and demand would not be met until 2050. Scenario 2 and 3 brings into question the need for Traveston Crossing Dam and for other programs to increase supply such as Wyaralong Dam<sup>8</sup>.



**Figure 5 Supply Demand Balance Scenarios (from Turner et al, 2007)**

An ecofeminist perspective would critique the Government’s choice of a mega dam as a key component of water planning in the 21<sup>st</sup> century Australia on the basis that this method of providing additional water supply regards natural resources as seemingly inexhaustible, and that the construction of expensive and heavy capital infrastructure for the purposes of harnessing, controlling and redirecting natural resources creates unnecessary social and environmental harm. The nature of this social and environmental harm can be highlighted by contrasting the government’s choice to build Traveston Crossing Dam with the guidance provided by the four permaculture design principles considered in this paper.

<sup>8</sup> This analysis was based on the drought ending in 2009 and focussed on long term planning post the schedule completion of Traveston Crossing dam in 2011.

**Table 1 Comparing Queensland Government’s approach with guidance offered by Permaculture**

<b>Permaculture Principle</b>	<b>Guidance from this principle</b>	<b>Comparison with choice of Traveston Crossing Dam</b>
Use small, slow (reduced energy intensity) solutions	Risk is reduced by favouring lower costs options that incrementally look to meet demand within an uncertain situation. Lower energy costs are preferred over high cost energy intensive solutions. Energy and effort is applied in increments so that the risk of wasted effort is reduced.	Traveston Crossing Dam is will inevitably have a high cost and also incur significant economic costs and social and environmental impacts. Implications of energy use for pumping water to Brisbane have not factored in the decision making <sup>9</sup> .
Self regulate and respond to feedback	Highlights that constant information and feedback is required in the system to make sure the strategies chosen are appropriate given the context. This context could be the social context (i.e. what people consider appropriate) and also the technical and economical context (i.e. what is the most economically and technically preferable option)	A mega-dam is not responsive and adaptable. The decision making process regarding SEQ water security has not been responsive to social, economic or technical feedback which suggests an alternative course of action.
Creatively use and respond to change.	Uncertainty and change is to be expected and systems designed to cope with uncertainty and, where possible, turn change into an opportunity.	Queensland Government have based their strategy on projected population and water use in SEQ in 43 years time in 2050. If their estimates are wrong, the strategy they have in place will not be able to make creative use of the change as the investment will be committed.
Use and value diversity	Diversity is recognised as an important response to uncertainty about future changes at all scales. Diversity is essential for increasing capacity to adapt and be flexible in the face of change. Hence it is linked to the resilience of the system.	Queensland Government strategy has taken steps in this direction with the inclusion of recycling and demand management as part of the overall strategy. Their strategy is reliant on this one big source of additional yield which is dependent on rain falling in one catchment. As a result the diversity and resilience of the strategy is significant reduced,

<sup>9</sup> It has been estimated that this project will produce 1,000,000 tonnes of Greenhouse Gases during operation (Turner et al. 2007).

		particularly when uncertainty of future climatic patterns is considered <sup>10</sup> .
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The alternative approach suggested by the MRCOM report (Turner et al. 2007) and depicted in Scenario 3 of Figure 5 is aligned with guidance offered from permaculture principles and ecofeminism. Scenario 3 is based on an approach called Integrated Resource Planning (IRP) which adopts adaptive management as one of its key tenets and provides space for broad engagement in decision making as well as minimising material flow and cost. With respect to water supplies IRP is based on the idea that:

*“The portfolio of options should be selected in a way that minimises risk associated with uncertainty. Rain-fed water supply systems are subject to occasional severe drought which is the major source of uncertainty. Trying to deal with this through investment in additional supply options can result in a significant over-investment. An approach which uses adaptive management and one which diversifies the range of options and avoids single large investments will help reduce risks. The application of the principles of real options analysis, with its recognition of the importance of delaying large irreversible investments as late as possible, is consistent with this approach.”*  
(White et al. 2006)

A key point of difference between the approach promoted by MRCOM and the Queensland Government<sup>11</sup> is the way of dealing with uncertainty created by the factors such as people’s behaviour and attitudes to water and water prices which influence future demand for water and climate change which influences the performance of supplies. The Queensland Government’s approach is to introduce a large buffer into the system which in theory<sup>12</sup> could be drawn upon if future demand is greater than predicted or if a drought worse than the current drought occurs. However as Meadows (1999), a prominent systems thinker, has identified buffers may increase stability of the systems but they also decrease flexibility and cannot be adapted to account for a situation in which future demand is less than predicted. In line with Meadows, permaculture design principles such as “use and value diversity” and “creatively use and respond to change” would suggest that an approach that is

<sup>10</sup> The Government claim to have taken both climate variability and climate change into account (Government Submission, Senate Inquiry, 18<sup>th</sup> April, 2007). However, there is a lack of transparency about how climate variability has affected estimates of required prudent yield. And climate change has been taken account of in a rather crude manner by increasing the required additional yield of from non rainfall dependent sources by 10% (Queensland Government 2007, p. 88).

<sup>11</sup> This form of analysis and justification of their position has not been made by the Queensland Government and Queensland Water commission.

<sup>12</sup> There are many questions from the affected community and technical experts and interested people regarding whether the dam will actually be able to supply the predicted yield. These concerns are based on climate change impacts, the way evaporation and seepage have been accounted for and concerns regarding the environmental flows required if the Government are to adhere to environmental requirements.

flexible, adaptable and diverse is more resilient in the face of uncertainty. The principle of “use small and slow (less energy intensive) solutions” provides guidance on how to achieve this flexibility and reduce exposure to risk in an uncertain environment.

MRCOM strategy depicted by Scenario 3 of Figure 5 was based on a “diverse portfolio of options” including “increasing water supply availability (supply-side options); decreasing the demand for water (demand-side options); and meeting water supply needs during deep droughts (drought response options)” (Turner et al. 2007, p. i). Demand-side options are an example of “small solutions” which are dispersed throughout the water using community but can cumulatively amount to large reductions in water consumption. The Queensland Government has included demand side options, but has not expanded these programs. The drought response options, which are referred to as “readiness options” introduce flexibility because they can be brought on line as needed and then taken out of the system when a drought breaks. In addition MRCOM approach is based on the concept of iteration and allows demand projections to be revisited frequently and supply and demand to be matched as closely as possible. Consequently large, preemptive investments in infrastructure that may not be needed are avoided. These differences between the MRCOM approach and the Queensland Government approach the valuable contribution that this alternative way of thinking about how we manage risks around running out of water.

### ***Community participation in the decision***

The approach that the Queensland Government has taken toward involvement of the communities concerned in the Traveston dam proposal has been widely criticised. An ecofeminist ethic poses questions that relate to who has the power to make decisions and who has been included or excluded from these decisions “... any movement claiming an ecological interest is simply incomplete without a critique of power” (Besthorne & McMillen, 2002, p.226).

To consider the implications of the conflict between differing ethical perspectives arising between the Queensland Government and opposing groups of people with an interest in the future of the Mary River the authors have adapted a method of boundary analysis developed by Gerald Midgley (Midgley 2000). This will be discussed following a selection of quotes which demonstrate the experience of the people directly affected in the Mary Valley. The Brisbane community has, to our knowledge, not been involved at all, except through the election in 2006, and as the previous section exemplifies, concerned members of the broader academic and scientific communities have been ignored by agents operating on behalf of the Queensland Government.

Some examples of the Mary Basin communities’ experiences include:

- The announcement to build the dam at Traveston Crossing (a) was made without community consultation.

*“There was no previous discussion or consultation with the community... it was like a bombshell falling on them when they found out about it... there was quite clearly a feeling in the community that this would not happen. There*



*was a real expectation...that when Peter Beattie [Queensland Premier] came up in June he was going to tell them that it was not going to happen” (Mr Ken Campbell, Lifeline Coordinating Counsellor Kandanga, Senate Inquiry Hansard, 17 April 2007).*

- There is also evidence that local government authorities such as the Department of Natural Resources and Main Roads were also taken completely by surprise.

*“This announcement came as so much of a shock that the other government departments did not even know about it. The Department of Main Roads did not even know about it. The Department of Main Roads had been part of a planning process for a Gumpie bypass on the Bruce Highway. It had not even factored in or raised the possibility of a dam being constructed at Traveston Crossing. It had never been part of any realistic, credible planning exercise conducted by this or any other government” (The Hon. Jeff Seeney, Deputy Leader of the Opposition, Queensland Parliament Hansard, June 7 2006)*

- Government agents have been widely criticised by residents for engaging in overbearing tactics to encourage property owners to voluntarily resume their lands.

*“... we were more or less scared into selling or putting up our properties for sale to the government. We were told that if we did not come to some agreement by the time they started to build the dam, we would get nothing. We would just be resumed and we could take whatever tiny bit they would offer us. In your 70s, you have not got time to reorganise yourself to move to other areas, make new friends and things like that... so quite a few of us thought, ‘Let’s go while we’re still young enough to resettle.’” (Mrs Boyer, local resident in inundation area, Senate Inquiry Hansard, 17 April, 2007).*

- The proposal has also created uncertainty for those indirectly affected either downstream or upstream of the dam. As one resident from the lower catchment of the Mary River explained during the Senate Inquiry:

*“... our community has been ignored by the Queensland government in relation to ... any downstream effects of the proposed dam. They have not provided us with any facts or figures on the changes to river heights, flows or water quality. If Traveston Crossing dam is constructed, our community will have to live with the impacts forever, yet no information sessions, brochures, fact sheets or letters have been sent to landowners” (Mrs Klupfel, President Tiaro and District Landcare Group<sup>13</sup>, Senate Inquiry Hansard, 17 April, 2007).*

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<sup>13</sup> Landcare is an Australia wide community driven program. Landcare groups are linked to certain geographical areas and often include farmers and other rural landowners. Like Lifeline, Landcare receives government funding, but it is not a government service.

### *Boundary analysis*

A boundary analysis is a systems thinking tool consistent with the authors' epistemological foundation. We have used this technique to consider the relationships between two key bounded communities involved in the issue, the Queensland Government and the Mary Basin community. The technique could be adapted widely for a more detailed analysis of the conflict and resolution processes presently occurring between communities and representatives of the state. However for this paper, we only consider the conflict presented by the decision to build the dam at Traveston Crossing. The primary boundary surrounds the Queensland Government community, its agents and representatives. They have adopted a narrow view of the Mary River as a site for water storage and extraction. The secondary boundary surrounds the community opposing the Traveston Dam who hold many other values sacred in their consideration of the broader perspectives of the environmental, agricultural, economic and social uses inherent in the Mary River catchment<sup>14</sup>. At this scale of analysis, all members of dissenting communities including academics and people within and outside the affected area are included within the secondary boundary. We suggest that the Queensland Government has sought to impose its values on the situation and make profane the values which many members of the Mary Valley community hold sacred<sup>15</sup>. According to the boundary analysis theory, such imposition of values can lead to dominance of one set of values over the other and stabilisation of conflict. However, the ethics and values arising from the community have been vocalised in a coordinated and authoritative fashion by groups such as Save the Mary River Co-ordinating group and the MRCOM. Consequently, the conflict between the Mary Valley community and the Government continues. We suggest that if the Queensland Government adopted a wider boundary with greater overlap with the values and ethics held by the communities in the Mary River catchment, the solutions offered by the Government would be more mindful of these values and conflict between the community and the Government would be significantly reduced.

To adopt a wider boundary, the Government would be required to adopt a genuine commitment to broader participation of affected communities. In practice, participation of the dissenting communities in the public decisions has been limited, as outlined in the evidence given to the Senate by various members of the opposing communities, some of which has been outlined in the section above. Broad participation is consistent with ecofeminism on the basis that ecofeminism questions the myth that scientific knowledge is the only way of knowing and the associated privileging of 'expert' knowledge over non-specialist knowledge. (Shiva & Mies, 1993, p 22). In essence, ecofeminism call for a reversal of existing power relations. It supports the post-normal scientific notion that 'extended facts' become important and anecdotal and qualitative sources of information from a range of community, media and other sources become valid methods to collate data for decision making and policy development. Valuing localized knowledge recognises that people not only

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<sup>14</sup> We acknowledge that there are diverse and in some case opposing knowledges and ethics in the Mary Valley community. Our characterisation of the community here is based on our experience of the actions to oppose the dam.

<sup>15</sup> According to Midgley (2000) values can become 'sacred' meaning valued, or 'profane' meaning devalued.

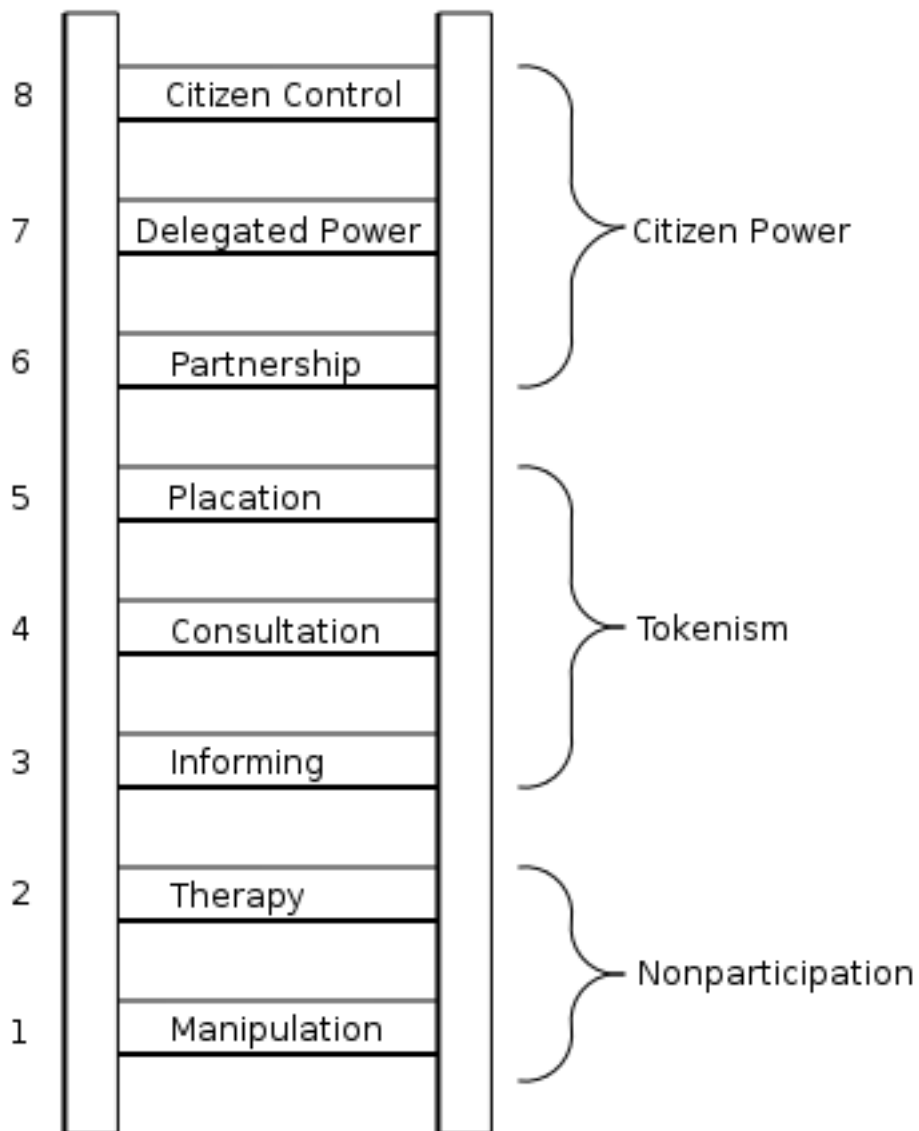
care about their environment (natural, social and personal) but can become ingenious and creative in finding practical, partly technological, ways towards its improvement. Here the quality is not merely in the verification, but also in the creation; local people can imagine solutions and reformulate problems in ways for which the accredited experts, with the best will in the world, are not prepared” (Ravetz, 1999, p. 652). Permaculture principles outlined in Table 1, particularly the principles of “self regulate and respond to feedback” and “use and value diversity”, are consistent with these notions because they promote feedback from and inclusion of diverse knowledges.

We do not dispute that the Queensland Government is faced with a highly complex decision in which they are required to manage the risk of the city of Brisbane running out of water. There are many factors to consider, but we question the assumptions that the government has made on behalf of affected communities in both the Mary Basin and Brisbane and the profane status that has been assigned to differing values of these communities. For instance, there is little evidence in the media or in the Senate Inquiry to suggest whether the Brisbane community is for or against the construction of the dam. It is questionable whether the people who would be using water from this dam have awareness of the impacts that this decision has on the Mary Basin and the Great Sandy Straits, nor the price they would be paying for water from this piece of infrastructure.

An alternative approach to community participation that is compatible with our systemic framework can be illustrated using Arnstein’s ladder of participation (Arnstein 1969) provided in Figure 6. This ladder illustrates the spectrum of community participation. The levels grouped under “citizen power” are consistent with an ecofeminist approach because they enable the values of diverse communities affected to be given a sacred rather than a profane status in the decision making process. Renn (1999, p.3050) sheds some light on how to “enhance competence” in the deci-making and “assign a fair share of the responsibility of managing risks” in a situation involving a complex risk choice. He suggests that:

- Scientific rationality is inadequate as the sole basis for the choice
- Anecdotal and systematic knowledge should be included
- Consequence of the risk and the potential for violation of interests and values need to be integrated in the decision
- There must be input from the people whose values are affected

The following section summarises the key findings of our application of an ecofeminist and permaculture principle based framework in terms of environmental values and approach to risk.



**Figure 6 Arnstein (1969) Ladder of Citizenship Participation**

### **Implications of our Analysis**

In our analysis of the Traveston Crossing Dam issue we have considered both an alternative approach to providing a secure water supply and an alternative approach to the process of community participation adopted by the Queensland Government. Contrasting environmental values held by the Government and diverse communities involved emerged as a key factor in the conflict over this issue. Previous sections eluded to contrasting approaches to managing risk that accompany these differing environmental values. In this section we expand on this issue of risk as it offers a focal point for both understanding the crux of this issue and illuminates ways of moving forward from here.

Use of ecofeminism and permaculture principles to compare the Government's proposal to provide water security and the MRCOM report's alternative recommendations, differing approaches to reduce the risk of running out of water are evident. These differences stem from the grounding of ecofeminism and permaculture principles in a complex systems and systems thinking view of the world and the resulting approach to managing uncertainty and risk. The permaculture principles offer guidance on how to manage risks that arise from uncertainty that is inevitable in a complex situation are listed in Table 1. They also highlight the necessity and benefit of selecting options and structuring systems to enable iteration in planning and adapting to the inevitably changing circumstances that arise in an uncertain decision making environment. An example, which is consistent with these principles, is offered by the following quote from one of the MRCOM report authors during the Senate Inquiry:

*"... if we are thinking about the future impact of climate change on our water supply, there is great uncertainty about what that will mean. It could mean a reduction in average rainfall; it could mean more volatile rainfall patterns. Certainly we need to be prepared for an increase in the level of uncertainty. We already have significant uncertainty in our hydrology and a sensible strategy in terms of dealing with that uncertainty is not to spend over \$2.5 [billion] on a single large rain fed supply as part of the system. That is a highly risky strategy in terms of meeting a demand-supply gap, even if it were necessary, which it is not" (Stuart White, Director of the Institute for Sustainable Futures, Senate inquiry, April 17, 2007).*

In terms of the process of community participation, the contrasting environmental values exposed through the boundary analysis above can also be regarded in terms of risk. The government perspective on risk has several differences to an approach aligned with ecofeminism and permaculture principles. The Government's primary concern appears to be to manage the risk of SEQ running out of water any time between 2007 and 2050 and to do so in a way that ensures favourable political outcomes. The alternative approaches we suggest seek to incorporate the values and perspective on appropriate and acceptable risk that are reflected in the dissenting community's boundary. These reflect high levels of uncertainty surrounding a wide range of environmental and social issues that include:

- risk that the project will fail leaving a 'stranded asset';
- risk of species extinction ;
- risk of adverse economic impact on business and industry both down and upstream of the dam wall;
- the risk that finding comparable farm land to continue agricultural practice will be too difficult, outside the region and/or beyond affordability;
- risk to World Heritage and RAMSAR wetlands;
- risk from non-negotiated road realignment, placement of \infrastructure and service provision, and;
- risk associated with gaining access to fair negotiation and recompense for resumed land.

In addition to addressing the risk of running out of water, this approach seeks to also incorporate community values regarding a spectrum of environmental, economic and social risks associated with a range of options available to provide water security.

In the following section we describe how this way of conceptualising the Traveston Crossing Dam conflict in terms of differing environmental values and approach to risk can form the basis of a way forward on the issue that embraces a way of thinking espoused by ecofeminism and the way of doing offered by permaculture principles.

## **A way forward**

A way forward based on ecofeminism and permaculture principles would require a process of community involvement which gives more power to citizens as envisaged in the higher levels of Arnstein's ladder of participation. This process would be based on transparency about the uncertainty and recognition of the value and importance of diverse knowledges, in addition to "expert" knowledge, to the issue. We argue that broader participation is essential in dealing with this issue, given that it is a complex risk choice involving contested alternatives to the dam, potential to send at least three species to extinct and a strong influence by peoples' choices and values regarding water consumption.

An alternative that would be desirable in the near-term could take shape in the form of a "*South East Queensland Conversation on Managing Risks around Water Security*". The suggestion would involve, at a minimum, the communities affected by proposed solutions such as the Mary Valley, communities who are in need of more secure water supplies such as Brisbane and the professional/academic community. In the following paragraphs we outline three key questions that a "*South East Queensland Conversation on Managing Risks around Water Security*" would need to address.

*Question 1: What approaches to reducing risk are acceptable to the community?*

- The purpose of this question is to enable exploration of the difference between the governments approach to managing risks associated with water planning and alternative proposals such as the MRCOM proposal. For example, it would consider whether people are comfortable with "readiness options" to deal with drought or prefer a large buffer or contingency built into the system as the Queensland Government has proposed.

*Question 2: What role are individuals and communities willing to take to take in bearing or reducing risks of different kinds?*

- This question would enable exploration of the communities' attitudes to the risks created by a proposal such as Traveston Crossing Dam and consideration of which of these risks are important to reduce and/or avoid. Importantly, it would also enable discussion regarding who should bear these risks. It could consider, the risk that this proposal could send three species extinct, the risk it will produce very expensive water and the risk to the wellbeing of Mary Valley communities and consider what individuals and communities might be willing to change or forgo in order to reduce or avoid any or all of these risks.

*Question 3: What does the future hold?*

- The purpose of this question to facilitate exploration of desirable water futures and the changes in current water consumption practices and other related practices that would be required to achieve this future. This question relates closely to the final point under the last question.
- A key point of focus would be the Level of Service (LOS) criteria which are used to calculate the yield of the SEQ water supply system. Discussion on this matter would enable communities to stipulate the level and frequency of restrictions they are willing to accept, in light of the consequences of where these criteria are set<sup>16</sup>. Such recognition of peoples values and preferences with regard to water security and uncertainty is consistent with recommendations from the Water Services Association Australia (WSAA) to water utilities (Erlanger & Neal 2005).

This conversation would embrace Button and Ryfe's suggestion that "an intrinsic value of democracy is that it allows citizens to see things from different points of view and that it enables individuals to come to see themselves as equal, capable and responsible members in a share political life" (Button & Ryfe 2005, p. 30). An important aspect of enabling people to see different points of view is that they are given information about these views and access to "expert" knowledge and other knowledges that they require to feel equal, capable and responsible with respect to the issue they consider.

There are many methodologies available that aim to facilitate finding a balance between risks and enable communities to make informed choices. These include citizens juries, world cafes and so on (Carson & Gelber 2001). Although the Queensland Government's sense of urgency about the need to construct Traveston Crossing Dam suggests otherwise, current measures the Government has put in place have delayed the risk of running out of water by about twenty years<sup>17</sup>. This is illustrated by Scenario 2 in Figure 5. Therefore there is ample time for the "*South East Queensland Conversation on Managing Risks around Water Security*" to occur and reach a conclusion.

Drawing on the work of Pidgeon, 1997, Renn has said that "participation is not only a normative goal of democracy, it is also a requirement for rational decision making in situations in which evaluating uncertainty is part of the management effort". Therefore our proposal is not based on romantic ideas about participation but on a desire to ensure that decisions regarding natural resource management are made with awareness of, and influence from broader social and environmental values than political expediency may allow. Revaluing our relationship and understanding of human interaction with nature includes a call for a full and complete evaluation of the environment and social costs of any use of natural resources which includes inclusive, consultative practices with communities, and exploration of alternative options to select the most life-supporting, sustainable option available (Shiva & Mies, 1993). We believe this is an imperative if we as a society are to negotiate future conflicts

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<sup>16</sup> As it currently stands the Queensland Government have made assumptions about the LOS people accept.

<sup>17</sup> Excluding the immediate crisis, which Traveston Crossing Dam cannot contribute to resolving.

over natural resources. As such we offer an opportunity to the political leaders of Queensland, and political leaders in similar circumstances elsewhere, to show that they are genuine advocates of democratic processes and sound decision making in the 21<sup>st</sup> Century. In essence, the concept of a “*South East Queensland Conversation on Managing Risks around Water Security*” presents a chance for a reinvention of sustainability.

## **Conclusion**

This is a paper that argues for a systems thinking approach to better manage Australia’s natural resources. By exploring the epistemology of ecofeminism and applying practical principles derived from permaculture we have adapted a range of methods and practices consistent with our framework to explore the social and environmental implications on the ecological values of the Mary Valley Basin. Our analysis supports the communities’ concerns that consultation has been extremely limited, failing to provide for the basic levels of consultation prior to making considerable monetary investment in a project that has not, and will not be granted approval to commence within at least 6 to 12 months from the time of writing this paper. In the face of heightened uncertainty and great risk with the onset of climatic changes to rainfall patterns on the Eastern Australian coast we believe the immediate social cost to the people of the Mary Valley has been unacceptably high.

Under these circumstances, the Queensland Government is taking a risk by disregarding the weight of dissenting opinion. Politicians may argue that uncertainty requires the taking of the “tough decisions” but this paper suggests that an iterative, participative, public conversation would reduce the environmental, social and economic risks. It is also questionable how “tough” this decision actually is, given that the different timeframes that politics and construction of a mega infrastructure projects operate ensure that the current government and its members will not be held accountable for this decision nor do they bear the risk. Instead the risk will be borne by Queensland taxpayers who may well subsidise a stranded asset, lose a valued ecosystem and vibrant small communities throughout the Mary Basin, and pay a significantly higher premium on water.

## **Bibliography**

- Arnstein, S.R. 1969, *A Ladder of Citizen Participation*, viewed 8 May 2007 <<http://lithgow-schmidt.dk/sherry-arnstein/ladder-of-citizen-participation.html>>.
- Besthorn, F.H. & McMillen, D.P. 2002, 'The Oppression of Women and Nature: Ecofeminism as a Framework for a Social Justice Oriented Social Work', *Families in Society: The Journal of Contemporary Human Services*, vol. 83, no. 3, pp. 221-232.
- Button & Ryfe, D.M. (eds) 2005, *Chapter 2*, Josse/Bass, San Francisco.
- Carson, L. & Gelber, K. 2001, *Ideas for Community Consultation: A discussion on principles and procedures for making consultation work* NSW Department of Urban Affairs and Planning Sydney.
- Commonwealth of Australia 2007, *Submissions received by the Committee*, , viewed June 18 2007



- [http://www.aph.gov.au/SENate/committee/rrat\\_ctte/traveston\\_dam/submissions/sublist.htm](http://www.aph.gov.au/SENate/committee/rrat_ctte/traveston_dam/submissions/sublist.htm)>.
- Erlanger, P. & Neal, B. 2005, *Framework for Urban Water Resource Planning*, WSAA - Occasional Paper No. 14, Water Services Association of Australia.
- GHD Pty Ltd 2006, *South East Queensland Regional Water Supply Strategy Desktop Review of Identified Dam and Weir Sites - Report to the Bulk Supply Infrastructure Task Group June 2006*.
- Gunderson, L. 1999, 'Resilience, Flexibility and Adaptive Management - Antidotes for Spurious Certitude?' *Conservation Ecology*, vol. 3, no. 1, p. 7, viewed 14 May 2007 <[online] URL: <http://www.consecol.org/vol3/iss1/art7/>>.
- Holmgren, D. 2002, *Permaculture: Principles and Pathways Beyond Sustainability*, Holmgren Design Services, Hepburn, Victoria.
- Holmgren, D. 2004, *Essence of Permaculture*, Holmgren Design Services, viewed 28 May 2006 <<http://www.holmgren.com.au/Writings/EssenceofPC.html> >.
- Jiggins, J. & Röling, N. 2000, 'Adaptive Management: potential and limitations for ecological governance', *International Journal of Agricultural Resources, Governance and Ecology* vol. 1, no. 1, pp. 28-42.
- Merchant, C. 1989, *The Death of Nature: Women, Ecology and the Scientific Revolution*, Harper & Row, New York.
- Midgley, G. 2000, *Systemic Intervention: Philosophy, Methodology and Practice*, Kluwer Academic/Plenum Publishers, New York.
- Mies, M. & Shiva, V. 1993, *Ecofeminism*, Spinifex Press, Melbourne.
- Mike Spencer, S.M., QWIPL 2007, 'Resumption of properties ', personal communication, 5 June 2007, Kandanga
- Proof Committee Hansard 2007a, *Proof Committee Hansard Reference: Options for additional water supplies for south-east Queensland, TUESDAY, 17 APRIL 2007, SENATE STANDING COMMITTEE ON RURAL AND REGIONAL AFFAIRS AND TRANSPORT*, viewed June 18 2007 <<http://www.aph.gov.au/hansard/senate/commtee/S10140.pdf>>.
- Proof Committee Hansard 2007b, *Proof Committee Hansard Reference: Options for additional water supplies for south-east Queensland, WEDNESDAY, 18 APRIL 2007, SENATE STANDING COMMITTEE ON RURAL AND REGIONAL AFFAIRS AND TRANSPORT*, viewed June 18 2007 <<http://www.aph.gov.au/hansard/senate/commtee/S10140.pdf>>.
- Queensland Department of Infrastructure 2007a, *Queensland the Smart State - Water for the Future* Queensland Government,.
- Queensland Department of Infrastructure 2007b, *Traveston Crossing Dam - Stage 1* Queensland Government, viewed 18 June 2007 <[www.coordinatorgeneral.qld.gov.au/major\\_projects/traveston.shtm](http://www.coordinatorgeneral.qld.gov.au/major_projects/traveston.shtm)>.
- Queensland Government 2007, *The State of Queensland Submission - Inquiry into Additional Water Supplies for South East Queensland - Traveston Crossing Dam*.
- Queensland Parliament 2007, *Official Records of the Debates of the Legislative Assembly (Hansard)*, Go Print Brisbane.
- Queensland Water Commission 2007a, *About the Queensland Water Commission* viewed 18 June 2007 <<http://www.qwc.qld.gov.au/About+QWC>>.
- Queensland Water Commission 2007b, *Projects and Planning*, viewed 18 June 2007 <<http://www.qwc.qld.gov.au/Projects+and+planning>>.

- Queensland Water Infrastructure 2007a, *Proposed Traveston Crossing Project Update March 2007*, viewed 19 June 2007 <<http://www.qldwi.com.au/library/pdf/newsletter1.pdf>>.
- Queensland Water Infrastructure 2007b, *Queensland Water Infrastructure Home Page*, viewed June 18 2007 <<http://www.qldwi.com.au/index.shtm>>.
- Senate Inquiry Hansard 2007a, *Proof Senate Committee Hansard Reference: Options for additional water supplies for south-east Queensland, FRIDAY, 11 MAY, 2007*, SENATE STANDING COMMITTEE ON RURAL AND REGIONAL AFFAIRS AND TRANSPORT, viewed June 18 2007 <<http://www.aph.gov.au/hansard/senate/commttee/S10200.pdf>>.
- Senate Inquiry Hansard 2007b, *Proof Senate Committee Hansard Reference: Options for additional water supplies for south-east Queensland, TUESDAY, 17 APRIL 2007*, SENATE STANDING COMMITTEE ON RURAL AND REGIONAL AFFAIRS AND TRANSPORT, viewed June 18 2007 <<http://www.aph.gov.au/hansard/senate/commttee/S10140.pdf>>.
- Senate Inquiry Hansard 2007c, *Proof Senate Committee Hansard Reference: Options for additional water supplies for south-east Queensland, WEDNESDAY, 18 APRIL 2007*, SENATE STANDING COMMITTEE ON RURAL AND REGIONAL AFFAIRS AND TRANSPORT, viewed June 18 2007 <<http://www.aph.gov.au/hansard/senate/commttee/S10140.pdf>>.
- Turner, A., Hausler, G., Carrard, N., Kazaglis, A., White, S., Hughes, A. & Johnson, T. 2007, *Review of Water Supply-Demand Options for South East Queensland*, viewed 23 February 2007 <[http://www.isf.uts.edu.au/whatsnew/SEQ\\_Review\\_full\\_report.pdf](http://www.isf.uts.edu.au/whatsnew/SEQ_Review_full_report.pdf)>.
- Warren, K.J. 2000, *Ecofeminist Philosophy: A Western Perspective on What It Is and Why It Matters*, Rowman & Littlefield, New York.
- White, S., Fane, S., Giurco, D. & Turner, A. 2006, 'Putting the economics in its place: decision making in an uncertain environment', paper presented to the *Biennial conference of the International Society of Ecological Economics: "Ecological Sustainability and Human Wellbeing"*, Delhi, India.